



PORTS and MARITIME AFFAIRS

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Directive No. SOLAS/14

INTACT AND DAMAGE STABILITY AND STRENGTH OF VESSELS

Issued under the enabling power of the Ministerial Resolution 20/2016

Issue Date: 29 December 2016

1 Introduction

(1) With reference to;

- Ports and Maritime Affairs (PMA) resolution no. 8/2016: regarding the implementation of the requirements of the International Convention for the Safety of Life at Sea, 1974 and its amendments
- SOLAS, International Convention for the Safety of Life at Sea, Consolidated Edition 2014, Chapter II-1, Part B to B-4, as amended.
- MARPOL, International Convention for the Prevention of Pollution from Ships, Consolidated Edition 2011, as amended
- International Convention on Load Lines, 2005 Edition, Part 3.
- Code of Safe Practice for the Safe Loading and Unloading of Bulk Carriers (BLU Code), 2011 Edition.
- International Code on Intact Stability, 2008 (2008 IS Code), 2009 Edition.
- International Safety Guide for Oil Tankers & Terminals (ISGOTT), Fifth Edition, 2006.
- IMO Resolution MEPC.54(32): Guidelines for the Development of Shipboard Oil Pollution Emergency Plans, adopted 6 March 1992.
- IMO Resolution MEPC.85(44): Guidelines for the Development of Shipboard Oil Pollution Emergency Plans for Oil and/or Noxious Liquid Substances, adopted 13 March 2000.
- IMO Circular MSC.1/Circ.1108: Guidelines for Assessing the Longitudinal Strength of Bulk Carriers During Loading, Unloading and Ballast Water Exchange, dated 25 May 2004.
- IMO Circular MSC.1/Circ.1400: Guidelines on Operational Information for Masters of Passenger Ships for Safe Return to Port by Own Power or Under Tow, dated 27 May 2011.



- IMO Circular MSC.1/Circ.1461: Guidelines for Verification of Damage Stability Requirements for Tankers, dated 8 July 2013.
 - MSC.369(93), Amendments to the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code), adopted 22 May 2014
 - MSC.370(93), Amendments to the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code), adopted 22 May 2014
 - MSC.376(93), Amendments to the Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (BCH Code), adopted 22 May 2014
 - MSC.377(93): Amendments to the Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (GC Code)", 22 May 2014.
 - MEPC.249(66), Amendments to the Code for the Construction and Equipment of Ships carrying dangerous chemicals in bulk (BCH Code), adopted 4 April 2014.
 - MEPC.250(66), Amendments to the International Code for the Construction and Equipment of Ships carrying dangerous chemicals in bulk (IBC Code), adopted 4 April 2014.
- (2) The PMA requires that vessels are classed with a recognized classification society and designed in conformity with SOLAS and other applicable IMO publications, issued from time to time.
- (3) The purpose of this directive are:
- (a) provide guidance to ship-owners and operators, port State control officers (PSCOs), Companies and Recognized Organizations (ROs) in respect to the various instruments on intact stability, damage stability, longitudinal strength, and damaged structural strength.
 - (b) clarify the requirements on these subjects and summarizes the related recommendations that contain many of the details necessary for compliance.
 - (c) ensure that appropriate information is available to the master and officers on board ships in conformity to the SOLAS and the ISM Code requirements.



- (d) improve the crew's knowledge and to enhance the implementation national requirements as well as the implementation of the IMO instruments.

2 Application

This directive applies to all Bahraini registered ship of 24 meters in length and over, as identified in the 2008 Intact Stability (IS) Code. This includes Commercial Yachts and Passenger Yachts (PAXYs) which fall into the categories of cargo ships and passenger ships, respectively.

3 Definitions

“Approval” or “Approved”: Whenever the words “approval” or “approved” are used throughout this directive, they shall mean approval by an entity that has been delegated authority under written agreement to act on behalf of the PMA with respect to Statutory Certification and Services. See Directive No. SOLAS/02 “Type Approval Certificate for Bahraini Ships” for more details.

4 Stability Booklet

- (1) SOLAS Regulation II-1/5-1 requires that the Master of every ship be supplied with sufficient information enabling him/her to obtain accurate guidance as to the stability of the ship under varying conditions of service. The PMA requires a copy of the stability information to be furnished directly to the RO.
- (2) Under the 2008 IS Code, each ship is required to be provided with a Stability Booklet, approved by the PMA, which contains sufficient information to enable the Master by rapid and simple processes to obtain accurate guidance as to the stability of the ship under varying conditions of service.
- (3) The approval of the Stability Booklet by, and filing of stability information with, the Classification Society with which the ship is classed shall be deemed to satisfy the PMA requirements and actions described in 1.1 and 1.2 above.
- (4) The Stability Booklet requirements above shall also apply for Commercial Yachts, with the 2008 IS Code providing full supporting details as applicable.



- (5) For further detail, refer to the 2008 IS Code, Part A – Mandatory Criteria: Chapter 2 (General criteria), and Chapter 3 (Special criteria for certain types of ships), and Part B – Recommendations and Additional Guidelines: Chapter 3 (Guidance in preparing stability information).

5 On-board Stability Instrument

- (1) Certain ships are required to carry a stability instrument on board, capable of verifying compliance with intact and damage stability requirements and be approved by the RO, acting on behalf of the PMA having regard to the performance standards recommended by the Organization. The timetable for compliance with this requirement is as follows:
- vessels constructed on or after 01 January 2016 (01 July 2016 for vessels subject to the IGC Code) shall comply.
 - vessels constructed before 01 January 2016 shall comply at the first scheduled renewal survey after 01 January 2016, but in no event later than 01 January 2021.
 - for vessels subject to the IGC Code, the compliance dates are six months later, (i.e., 01 July 2016 and 01 July 2021 respectively).

Note that the term “stability instrument” comprises both hardware and software.

- (2) The IMO published seven (7) instruments that, among other things, require the carriage of an on-board stability instrument, as different Codes are mandatory under either SOLAS and/or MARPOL. The individual instruments and the types of ships they are applicable to are:
- Oil Tankers:**
As per Resolution MEPC.248(66), all oil tankers shall be fitted with a stability instrument in accordance with the schedule presented in paragraph 5.1 above; and the RO, acting on behalf of the PMA, shall issue a document of approval for the stability instrument. In addition, new items regarding the stability instrument have been added to the IOPP Certificate and Supplements (Form B).
 - BCH Code Ships:**
As per Resolutions MEPC.249(66) and MSC.376(93), all ships subject to the BCH Code shall be fitted with a stability instrument in



accordance with the schedule presented in section 5.1 above; and the RO, acting on behalf of the PMA, shall issue a document of approval for the stability instrument. This resolution added new items on the stability instrument to the Certificate of Fitness.

(c) **IBC Code Ships:**

As per Resolutions MEPC.250(66) and MSC.369(93), all ships subject to the IBC Code shall be fitted with a stability instrument in accordance with the schedule presented in paragraph 5.1 above; and the RO, acting on behalf of the PMA, shall issue a document of approval for the stability instrument. This resolution added new items on the stability instrument to the Certificate of Fitness.

(d) **GC Code Ships:**

As per Resolution MSC.377(93), all ships subject to the GC Code and, per Annex 13 of the Report of the MSC on its 93rd Session, all ships subject to the EGC Code, shall be fitted with a stability instrument in accordance with the schedule presented in paragraph 5.1 above; and the RO, acting on behalf of the PMA, shall issue a document of approval for the stability instrument. This resolution added new items on the stability instrument to the Certificate of Fitness in the GC Code. The PMA requires that those vessels subject to the GC Code comply with these provisions within the timeframe set forth in paragraph 5.1 above.

(e) **IGC Code Ships:**

As per Resolution MSC.370(93), section 2.2 of the revised IGC Code, all ships subject to the IGC Code shall be fitted with a stability instrument in accordance with the schedule presented in paragraph 5.1 above; and the RO, acting on behalf of the PMA, shall issue a document of approval for the stability instrument. Paragraph 6 of the Certificate of Fitness covers items regarding the stability instrument. Attention is also drawn to paragraph 1.4.1.4 of the above MSC Resolution.

(f) **Passenger Ships:**

As per Circular MSC.1/Circ.1400 strongly recommends that all passenger ships have at least two independent stability computers installed on board, it capable of processing the data and providing the necessary information to the Master.



- (3) Notwithstanding the carriage requirements in paragraphs 5.1 and 5.2 above, an existing stability instrument need not be replaced, provided that it is capable of verifying compliance with the applicable intact and damage stability requirements to the satisfaction of the PMA's RO. Otherwise, the existing equipment must be upgraded or a new stability instrument must be installed, approved and certified.
- (4) Upon application for a waiver from the requirement for the carriage of a stability instrument, the RO, acting on behalf of the PMA, shall forward such request to the PMA along with the RO's recommendation as to whether or not to grant such request. The recommendation must contain the reason for the waiver, the category under which it is justified, and justification and documentation that the safety of the ship is not impaired. Generally, the conditions for a waiver are specified in the applicable IMO resolution(s) as referenced in paragraphs 1.1 above and the PMA will rely on the recommendation of the RO when making its decision.

6 Damage Stability

- (1) In accordance with SOLAS Regulation II-1/4, damage stability requirements apply to all ships of 80 meters in length and upwards, and all passenger ships regardless of length. In addition, IMO Circular MSC.1/Circ.1461 includes guidelines for the verification of damage stability requirements for tankers, including oil tankers, chemical tankers, and gas carriers; and addresses training for persons engaged in damage stability verification. The stability instruments that are newly required per paragraph 5 above shall be capable of verifying compliance with the applicable damage stability requirements.
- (2) Yachts are required to comply with the relevant sections on damage stability.

7 Longitudinal Strength

- (1) In accordance with the International Convention on Load Lines, 2005 Edition, Part 3, Consolidated Text, Chapter II, Regulation 10, the Master of every ship shall be supplied with information to arrange for the loading and ballasting of his or her ship in such a way as to avoid the creation of any unacceptable stresses in the ship's structure, provided that this



requirement need not apply to any particular length, design, or class of ship where the PMA considers it to be unnecessary.

- (2) For any ship that carries cargo in bulk, the sequence of loading and discharging cargo affects overall strength and must be monitored during such operations. As per SOLAS Regulation VI/7.3, the Master and terminal representative shall agree on a plan to ensure that the permissible forces and moments on the ship are not exceeded during loading or unloading of any solid bulk cargo. The approved loading manual for the vessel should contain typical loading and unloading loading sequences, as well as part load conditions that may be relevant. The use of a loading instrument is highly recommended to monitor actual hull bending and shear stresses during loading and unloading sequences.
- (3) IMO Circular MSC.1/Circ.1108 provides guidance for assessing the longitudinal strength of bulk carriers during loading, unloading, and ballast water exchange operations. Likewise, section 11.2 of the International Safety Guide for Oil Tankers and Terminals provides guidance for loading and discharging tankers, including ballast operations, to keep shear forces and bending moments within prescribed limits. The Code of Safe Practice for the Safe Loading and Unloading of Bulk Carriers (BLU Code) recommends that loading and unloading plans be jointly reviewed by the Master and terminal personnel prior to start of any loading/unloading operations, and that such operations are then carefully followed, to insure that the entire sequence stays within the stress limits of the ship. IMO Resolution MSC.238(82) added grain carriers to the ships covered by this Code of Safe Practice.

8 Shipboard Emergency Plan

- (1) As per MARPOL Regulation I/37, every oil tanker of 150 gross tons and above, and every ship other than an oil tanker of 400 gross tons and above, shall carry a shipboard oil pollution emergency plan (the "Plan") approved by the PMA or its RO. Section 2.5 of IMO Resolution MEPC.54(32) requires that the Plan contain steps to control the discharge of oil from the ship, and notes that such Plan shall address stability and stress considerations and shall provide the Master with detailed guidance to ensure these aspects are properly considered.



- (2) Specifically, section 2.5.3.2 of IMO Resolution MEPC.54(32), Guidelines for the Development of Shipboard Oil Pollution Emergency Plans, contains the following:
- (a) "Great care in casualty response must be taken to consider stability and stress when taking actions to mitigate the spillage of oil or to free the ship if aground. The Plan should provide the Master with detailed guidance to ensure these aspects are properly considered."
 - (b) "Internal transfers should be undertaken only with a full appreciation of the likely impact on the ship's overall stress and stability. When the damage sustained is extensive, the impact of internal transfers on stress and stability may be impossible for the ship to assess. Contact may have to be made with the owner or operator or other entity in order that information can be provided so that damage stability and damaged longitudinal strength assessments may be made."
 - (c) "The Plan should clearly indicate who the Master should contact in order to gain access to these facilities."
 - (d) "Where appropriate, the Plan should provide a list of information required for making damage stability and damaged longitudinal strength assessments."
- (3) IMO Resolution MEPC.85(44), Guidelines for the Development of Shipboard Marine Pollution Emergency Plans for Oil and/or Noxious Liquid Substances, repeats all of the above guidance, with the added note that: "In the case of ships certified to carry Noxious Liquid Substances (NLSs), consideration as to the compatibility of all substances involved, such as cargoes, bunkers, tanks, coatings, piping, etc., must also be considered before such an operation is undertaken."
- (4) The clear intent of these Guidelines is that the Plan is to include external support for the Master such that competent, informed decisions can be made and proper action taken in situations involving structural damage to the ship.



9 Damaged Structural Strength

- (1) As outlined above, Resolution MEPC.54(32) states that support is to be made available to the Master to provide assessments of damaged structural strength when the primary structure of the ship has been damaged in an emergency situation. The PMA would advise owners and/or operators to provide such support through their head office technical departments, independent organizations, and/or the classifications societies, as may be appropriate.
- (2) It is important to note that in the event of any damage occurring to a ship which requires reporting to the Flag (PMA), port State, and RO, specialist advice is to always be sought to verify the continued structural integrity of the ship. To facilitate this effort, a dedicated set of basic emergency response plans is to be kept immediately available for each ship; such plans to include the lines; general arrangement; stability booklet/loading manual; tank capacity tables; table of watertight compartments with moulded volumes, centres of gravity, and permeability's; hydrostatic curves; cross curves of stability; key structural plans; and complete vessel dimensions (including frame spacing, deck heights, and the locations of opening points between compartments), as a suggested minimum. The on board Emergency Plan must contain full contact particulars and a list of what information will be needed from the ship.

10 Office-based Support

- (1) A per MARPOL Regulation I/37.4, all oil tankers of 5,000 tonnes deadweight or more shall have prompt access to computerized shore-based damage stability and residual structural strength calculation programs. This definition of "oil tanker" includes any tanker that is carrying any cargo of oil. This requirement for tankers satisfies the requirements outlined in paragraph 9 above and the appropriate contact information which is to be incorporated into the on board Emergency Plans covered in paragraph 8.
- (2) Circular MSC.1/Circ.1400 strongly recommends that the owners or operators of passenger ships ensure that their ships have prearranged, prompt access to computerized, shore-based damage stability and residual structural strength calculation programs, including significant detail as to the scope of support that must be provided.



11 Ballast Water Exchange

Where applicable, the Stability Booklet (paragraph 4 above), the on-board Stability Instrument (paragraph 5 above), the on-board Loading and Strength Criteria (paragraph 7 above), and any shore-based programs (paragraph 9 and 10 above), must all have the capability to monitor both stability and strength during any ballast water exchange procedures that may be required. The Master must have access to the necessary stability and strength information so he can confirm that neither his vessel's stability nor his vessel's strength is adversely affected at any intermediate points of any ballast water exchange operation. IMO Circular MSC.1/Circ.1108 provides guidance for assessing the longitudinal strength of bulk carriers during ballast water exchange operations.

12 Penalty

Failure to comply with this directive, the Navigation License may be withdrawn, and/or the ship's master and the company may be fined in accordance with Amiri Decree No. 14/1978.

13 Revision History

Revision No. 1 of the present Directive is the first revision.

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29th December 2016